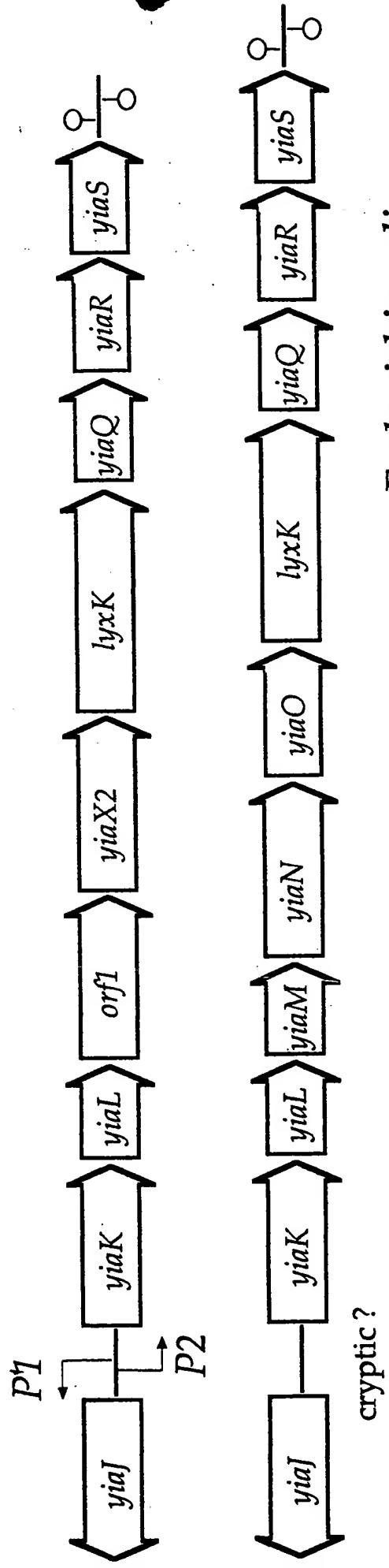


Figure 1

Klebsiella oxytoca



Appendix

Escherichia coli

Figure 2A

GGATCCGGGGCGCAAAGGCGGAGACGCCAGAACAGTCTGGTCTGCTGATGGGACACCACGCAGGCACACTCACAGGT 80
 ACGGCAGGGATGCACTCTCCGCATCCGCAGAATAAACGATTCACTCTCCATTGGGATAAAAACGAGAGTGC 160
 CAGAAAAAACCGTTCCCTCTCCCTTGATCCTGAATGGAGTCAGCGGCTTCTCTCAGATGTCCGGATTATCTGG 240

* G E R V S F G L E R S I A E A T D R L P K L 320
 TCATTTGCCCTAACCTTCCCGACGGAAAAGCCCAGTCGCAGAAATGCCCTCGCGTACGGCTTGA

L N K E G V Q K L R S T S L S I S I A Y P V R G H I D 400
 AATTTCTCTCCACCTGCTGAGGCGCAGTGTGATAGAGAGATAGAAATGCCATAAGGCACGCCATGGATATCA

F V P V A L C S V G L E N E E R D M A M N R E R I Q A 480
 AAAACGGGACAGCCAGGCACGACACGCCAGCTCGTCTCCCTGCCATGCCATATTGCTCGGGATCTGCC

L E D H M A P L G T I T N R T L P Q I I E Q H S N W 560
 CAGTTCATCATGCAGGCAAGCCGGTAATGGTATTACGGGTAGCGCTGGATAATCTCTGGTGTGAATTCCAGT

Y S E V Y D P H G F A M Y I K A W Q R A T C R M H Q G 640
 AGCTCTCAACGTAGTCAGGATGCCAACGCCATATAATCTTGCCCATTGCCAGCAGTACAGCGCATGTGCTGCCA

I Y A R T R L M G T T P E L K Y I L I A H D D E R S S 720
 ATATAGGCCGCGTACGCAGCATACGGTGGCTGGCTCAGCTTATAATCAGGATCGCTGGTCACTTCACGGCTGG

F N V T E G T A L N L A E L H P A A V H I I N L S S 800
 GAAGTTACCGTCTGCCGGTGGCCAGGTTAAgCGCCTCAAGATGCCGCGCAGTGGATAATATTAGCGACGACA

L A K Q G V R I F K T T L A Y S G A A P A P T V Y G C 880
 ACGCCCTTTGCCAACCGGATAAAATTGTCGTAGCGCATAGCTCCCCGCCGGGgCAGCGTCACGTACCCGAG

S Q L G Q L L R H V T S K N L G A L E S L H A V P C G 960
 GACTGCAGCCCCCTGTAATAAGCGATGAACGGTACTTTGTTCAAGTCCCAGTTCCGACAGATGCCACGGGACAGCC

N P Y N S L I E I L M L G R F L S Q S G A P R E K D 1040
 ATTTGGATAATTACTCAGGATCTCAATTAGCATCAACCCACGAAAAGGCTCTGACTTCCGGCAGGCCCTCTTTATCTT

Q T N E S E K T G M 1120
 GCGTGTCTCGCTTCTTGTGCCCATCGCTCCGCTCCATTGGTCGCTTCAGATGGTAGCGCAAAGTGTGTTTC

yiaj ← 1200
 AGTCACGATCTGAACCGAAAAAACACAACCTTATGATTTTATGATTTTAAACGCTGCCGTTGATCTGACAA 1280
 AAATTGATCGCTATATTGAAATCAGATTGCAAGTGAATTTAGAGATAAAAAGCGATCAACTCTGACCAGGAAA

→ *yiaK* 1360
 CAGCAATGAAAGTCACGTTGAGCAGTTAAAGAGGCATTCAATCGGGTACTGCTGGACgcgtgcgtgcggGGAAACC

M K V T F E Q L K E A F N R V L L D A C V A R E T

GCCGATGCCCTGCCAGAAATGTTGCCCGACCCACCGAATCCGGCTATTCTCACGGCTGAACCGCTTCCCTGCC 1440
 ADA C A E M F A R T T E S G V Y S H G V N R F P R F

CATCCAGCAGTTGGATAACGGCAGATTCCCTGAGGCTCAACCGCAGCGGTGACCACGCTCGGCCATGAAACAGT 1520
 I Q Q L D N G D I I P E A Q P Q R V T T L G A I E Q W

GGGATGCTAGCGTCCATGCCAACCTGACGGCAGAAAGATGATGGATGGCCATTGAGCTGGCTCCGATCACGGT 1600
 D A Q R S I G N L T A K K M M D R A I E L A S D H G

ATCGGCCCTGGTCGCCCTACGTAATGCTAACCAACTGGATGCGCGGGCAgCTACGGCTGGCAGGCCGGAAAAAGGCTA 1680
 I G L V A L R N A N H W M R G G S Y G W Q A A E K G Y

CATCGGTATCTGCTGGACCAACTCCATGCCGTTATGgcGCCATGGGCGCTAAAGAGTGGCTATCGGTACCAACCGC 1760
 I G I C W T N S I A V M A P W G A K E C R I G T N P L

TGATCGTCGCCATTCCGTCGACGCCGATCACCATGGGGATATGTCGATGTCGATGTTCTCTACGGCATGCTGGAGGTT 1840
 I V A I P S T P I T M V D M S M S M F S Y G M L E V

Figure 2B

AACCGCCTTGCCTGGCGCGAAGTGCCTGGACGGCGATTGACGGATGACGGTGTGACCAAAGAGCCGGGACGAT	1920
N R L A G R E L P V D G G F D D D G R L T K E P G T I	
CGAGAAAAATCGCCGCATTTACCCATGGCTACTGGAAAGGTTCCGGCTGTCGATCGTGTGGATATGATTGCCACCC	2000
E K N R R I L P M G Y W K G S G L S I V L D M I A T L	
TCCTCTCCAACGGATCGTCGGTGCGAAGTGACCCAGGAAACAGCGATGAATATGGCGTTCGCAGATCTTCATCGCT	2080
L S N G S S V A E V T Q E N S D E Y G V S Q I F I A	
ATTGAAGTGGATAAGCTGATCGACGGCGAACCCCGCACGCCAAGCTGCAACGGATTATGGATTCATCACCAACGCCGA	2160
I E V D K L I D G A T R D A K L Q R I M D F I T T A E	
GCGCGCCGATGAAAATGTGGCGTCCGTCTCCCTGGCATGAATTACCCGTCTGCTGGATGAAAACGCCGCAACGCCA	2240
R A D E N V A V R L P G H E F T R L L D E N R R N G I	
TTACCGTCGATGACAGCGTATGGCCAAAATTCAAGCGCTGTAAGGAGCTCACCCATGACAGCGTATGGCCAAAATTCA	2320
T V D D S V W A K I Q A L *	
→ <i>yiaL</i>	
GGCGCTGTAAGGAGCTCACCCATGATTTGGTCATATTGCTCAACCTAACCGTGTCTGCCCGGCCATTGAGCG	2400
M I F G H I A Q P N P C R L P A A I E R	
GGCGCTTGATTTCTGCGCACGACGGATTCCACCGCCTGGCACCCGGCGTGGAAATCGACGCCAAAACATCTTCG	2480
A L D F L R T T D F H A L A P G V V E I D G Q N I F A	
CGCAGGTTATCGACTTAACCACCGCGATGCCGCTGAAAATCGTCCGGAGGTCCACCGTCGCTATCTGGATATCCAGTT	2560
Q V I D L T T R D A A E N R P E V H R R Y L D I Q F	
CTGGCATGGCGAAGAAAAATCGGTATGCCATTGATACCGGAATAATCAAATCAGCGAATCTTATTAGAACAGCG	2640
L A S G E E K I G I A I D T G N N Q I S E S L L E Q R	
CGATATTATTTTATCACGACAGCGAACATGAATCGTCTTGGAAATGACGCCAGGCAACTATGCGATATTTTCCCGC	2720
D I I F Y H D S E H E S F F E M T P G N Y A I F F P Q	
AAGATGTTATCGTCCTGGATGTAATAAAACTGTAGCCACGCCATCCGAAAGATCGTTAAAGTCGCTATTCAGTT	2800
D V H R P G C N K T V A T P I R K I V V K V A I S V	
→ <i>orf1</i>	
TTATAAGAAGGAGCACAAATGAATAATACCGGTTACATTATCGGTGGCTACCCCTGTGCCCTGTGCACCCCT	2880
L * M N S N N T G Y I I G A Y P C A P C A P S	
CATTTCACCAAAAGAGTGAAGAGGAAGAGaTGGAATTCTGGCGGAGCTCTCCGACACCCGGATATTGGGGCTGGAG	2960
F H Q K S E E E M E F W R Q L S D T P D I R G L E	
CAACCCCTGCCTACCCCTGCCTGAACATCTCATCCGCTGGCGACGGAGTGGTTATGGCCCATACCCGGGACACTGGCA	3040
Q P C L P C L E H L H P L G D E W L L R H T P G H W Q	
GATTGTCGTTACCGCCATCATGGAAACCATGCGCCGCCGGTGGAAACGGCGCTTGGCTGGCGTCCAGCGACGAAA	3120
I V V T A I M E T M R R R G E N G G F G L A S S D E T	
CGCAGCGCAAAGCTGCGTGGAGTACTATGCCACCTGCAGCAGAAGATCGCTAAATCAATGGCAATACGCCGGAAAG	3200
Q R K A C V E Y Y R H L Q Q K I A K I N G N T A G K	
GTCATTGCCCTTGAGCTTCACGCCGCCCTGGCGGGCAATGCCAACGTGGCTCAGGCTACCGACGCCCTTGCCGGTTC	3280
V I A L E L H A A P L A G N A N V A Q A T D A F A R S	
ATTAAAAGAAATTACCGCTGGGACTGGCTCTGCGAGCTGGCTGGAGCACTGCGACGCGATGACGCCAGCGCGCCGC	3360
L K E I T R W D W S C E L V L E H C D A M T G S A P R	
GCAAAGGATTTTGGCGTTAGAAAACGTGCTGGAAGCCATTGCCGATTGACGTTgGCATTGTATTAACGGCGCGT	3440
K G F L P L E N V L E A I A D Y D V G I C I N W A R	

Figure 2C

TCGGCCATTGAAGGGCGGAATACCGTGTACCGCTCACCCATAACGCAGCAGGTAAAACGGGCAGGAAAGCTCGGCCGCGCT	3520
S A I E G R N T V L P L T H T Q Q V K R A G K L G A L	
GATgTTTCTGGCACGACGCAgACCGCGAGTACGGCAATGGCAGGATTACACGCGCCGTCGCGCCTTCTGCCCGC	3600
M F S G T T Q T G E Y G E W Q D L H A P F A P F C P Q	
AqAGCCTGATGACCACCGAACACGCTCGTGAATTATTCGCTGCGAGGAACCGCCCCCTGCAATTTCAGGCATTAAA	3680
S L M T T E H A R E L F A C A G T A P L Q F S G I K	
TTACTGGAAATTAAATGCCAGCGAACACGTTGATCATCGCATCGCATATTACCGACGGCATCTCCGCCTAAAACAAGC	3760
L L E I N A S A N V D H R I A I L R D G I S A L K Q A	
→ <i>yiaX2</i>	
ACAATAATAATAATCACCTTCATCACCAAGAATATTTAATATTACGAGACTATAAGATgAAATATAACCTCTAACTCTA	3840
Q * M N I T S N S T	
CAACCAAAGATATACCGGCCAGCGCTGGTTAAGAACATTCGCCTATACTGATCACTTGTATTATTCCTATATGGAC	3920
T K D I P R Q R W L R I I P P I L I T C I I S Y M D	
CGGGTCAATATTGCCCTTGCGATGCCGGAGGTATGGATGCCACTTAGGTATTCCGCCACCATGGCGGGCTGGCGGG	4000
R V N I A F A M P G G M D A D L G I S A T M A G L A G	
CGGTATTTCTTATCGTTATCTATTTACAGGTTCCCGGGAAAATTGCCGTTACCGTAGCGGTAAAGAAATTAA	4080
G I F F I G Y L F L Q V P G G K I A V H G S G K K F I	
TCGGCTGGTCGCTGGTCGCCCTGGCGGTCACTCCGTGCTGACGGGTTAATTACCAATCAGTACCAAGCTGCTGGCCCTG	4160
G W S L V A W A V I S V L T G L I T N Q Y Q L A L	
CGCTTCTTACTGGCGTGGCGGAAGCGGTATGCTGCCGTCGTTCTCACGATGATCAGTAACGGTTCCCCGACGCTGA	4240
R F L L G V A E G G M L P V V L T M I S N W F P D A E	
ACGCGGTGCGCCAACCGATTGTCATTATGTTGTGCCGATTGCCGGATTATCACCGCCCCACTCTCAGGCTGGATTAA	4320
R G R A N A I V I M F V P I A G I I T A P L S G W I I	
TCACGGTTCTGACTGGCGCTGGCTGGATTATCGAAGGTTGCTCTCGCTGGTTCTGGTCATACACC	4400
T V L D W R W L F I I E G L L S L V V L V L W A Y T	
ATCTATGACCGTCCGCAGGAAGCGCGCTGGATTCCGAAGCAGAGAAGCGCTATCTGGTCAGACGCTGGCGCGAGCA	4480
I Y D R P Q E A R W I S E A E K R Y L V E T L A A E Q	
AAAAGCCATTGCCGGCACCGAGGTGAAAACGCCCTCTGAGCGCCGTCCTCCGACAAAACCATGTGGCAGCTTATCG	4560
K A I A G T E V K N A S L S A V L S D K T M W Q L I A	
CCCTGAACCTCTTACCAgACCGCATTACGGCTACaCCCTGGCTACCCACCATTCTGAAAGAATTGACCCATAGC	4640
L N F F Y Q T G I Y G Y T L W L P T I L K E L T H S	
AGCATGGGGCAGGTGGCATGCTGCCATTCTGCCGTACGTCGGGCCATTGCTGGGATGTTCTGGTTCTCCCTCCCTTC	4720
S M G Q V G M L A I L P Y V G A I A G M F L F S S L S	
AGACCGAACCGTAAACGCAAGCTGTTGCTGCCGCTGCGCTgATTGGCTTCGCTCTGTGCATGTTCTGTCGGTGGCGC	4800
D R T G K R K L F V C L P L I G F A L C M F L S V A L	
TgAAAAACCAAATTGGCTCTCTATGCCGCGCTGGCTGGCTGCGGATTCTTCTGCAATCGCGGCTGGCGTGGTCTGG	4880
K N Q I W L S Y A A L V G C G F F L Q S A A G V F W	
ACCATCCGGCACCTGTTAGCGCGGAAATGGCGGGCGGCCGGCGGGTTATCAACCGCCTGGCAACCTCGCGG	4960
T I P A R L F S A E M A G G A R G V I N A L G N L G G	
ATTTTGTGGCCCTATGCCGTCGGGTGCTGATCACGTTgTACAGCAAAGACGCTgGCGTCTATTGCCCTGGCGATCTCCC	5040
F C G P Y A V G V L I T L Y S K D A G V Y C L A I S L	

Figure 2D

TGGCGCTGGCCGCGTGTGATgGCGCTgCTGCTGCCGGCGAAATGCGATGCCgGTGCTGCCGGCTaAAgACgATAAaTCCA 5120
 A L A A L M A L L L P A K C D A G A A P V K T I N P

 CATAAACGCACTCGTAAACTCGAGCCCGGCCGCTgCGCCTGCCGGCTGCCAAATATGCCGGTTCACCCGGTaAC 5200
 H K R T A *
 → *lyxK*
 AATgAGATGCgAAAgATGAGCAAgAAACAgGCCTCTGGCTGGTATTGATTGCGGCGGCACCTATCTGAAAGCCGGTT 5280
 M S K K Q A F W L G I D C G G T Y L K A G L

 ATATGACGCCGAAGGTATGAAACATGGCATTGTGCCGAAGCGCTACGGACGATGTCGCCCTGCCGGTTACGCCGAAC 5360
 Y D A E G H E H G I V R Q A L R T M S P L P G Y A E R

 GCGACATGCCAGCTCTGGCAACACTGCCGGCGACCATTGCCGGCTATTACAGCAGGCAGGTGTATCCGGCGAACAG 5440
 D M R Q L W Q H C A A T I A G L L Q Q A G V S G E Q

 ATTAAAGGCGTGGGATCTCCGCTCAGGGTCAAGGGCTCTTCCTCTCGATAAGCAGGATCGGCCGCTGGGTAACGCCAT 5520
 I K G V G I S A Q G Q G L F L L D K Q D R P L G N A I

 CCTCTCCGATCGTCGGCGCTGAAATCGTCAGCGCTGGCAGCGGGACCGTATTCCCGAACGGCTCTATCCCGTTA 5600
 L S S D R R A L K I V Q R W Q R D R I P E R L Y P V T

 CCCGCCAGACGCTGTGGACCGGACATCCGGCTCTTGCTGCCGTGGTAAAAGAGAATGAACCCAGCGCTACGCCAA 5680
 R Q T L W T G H P A S L L R W V K E N E P Q R Y A Q

 ATTGGCTCGTGTGATGGGGCATGACTATCTCGCTGGCTTAACCGCGCGAAGGGCTGCCAGGGAGCAACATCTC 5760
 I G C V M M G H D Y L R W C L T G A K G C E E S N I S

 CGAGTCCAACCTCTACAACATGGCCATGGCCAGTACGACCCGCCCTGACCGAGTGGCTGGCATGGTAAATCGATA 5840
 E S N L Y N M A M G Q Y D P R L T E W L G I G E I D S

 GCGCGCTGCCCGCTGTAGGGTCAAGCGAAATTGCGGGGAGATCACCGCTCAGGCAGCCGCTTAACCGTCTGGCG 5920
 A L P P V V G S A E I C G E I T A Q A A A L T G L A

 GCGGGTACTCCGTCGTTGGCCCTGTTGACGTGGCTCCACCGCCCTTGGCCGGGATTGAGGATGAGTCGACCC 6000
 A G T P V V G G L F D V V S T A L C A G I E D E S T L

 CAATGCGGTGATGGGGACCTGGCCGTCAGCGGTATCGCTCACGGCTGCCGACCATGAGGCCACCCCTACGTCT 6080
 N A V M G T W A V T S G I A H G L R D H E A H P Y V Y

 ATGGCCGCTACGTCAATGACGCCAGTATATCGTCAGCAAGCCAGCCGACCTCATCCGCAACCTcGAATGGTTACC 6160
 G R Y V N D G Q Y I V H E A S P T S S G N L E W F T

 GCCCAGTGGGGCATCTCTGTTGATGAGATCAATCAGGCCGTCGCCAGCCTGCCAAAGCCGGAGCGAGCTTTT 6240
 A Q W G D L S F D E I N Q A V A S L P K A G S E L F F

 TCTGCCGTTCTGTATGGCAGCAACGCCGGCTGGAGATGACCTGCCGCTTACGGCATGCAGCGCTGCATACCCGCG 6320
 L P F L Y G S N A G L E M T C G F Y G M Q A L H T R A

 CGCACCTGCTGCAGGCCGGTTATGAAGGGTGGTATTAGCCATATGACCCACCTCAGCCGTATGCCGAACGCTTACA 6400
 H L L Q A V Y E G V V F S H M T H L S R M R E R F T

 AACGTTCAAGGCCCTGCCGTACCGGGCCGGCGACTCCGACGTCTGGATGCAGATGCTGGCGGACGTAAGCCGGCTT 6480
 N V Q A L R V T G G P A H S D V W M Q M L A D V S G L

 ACGCATGAACCTCCGAAGGTGGAAGAGACCGGCTGTTGGCCGGCCCTGCCGCTGTCGGtACCGGtACCGGCGTATACC 6560
 R I E L P K V E E T G C F G A A L A A R V G T G V Y R

 GCAGcTTAGCGAAGCCGGCGCCGGCAGCACCCGGTGCACGcTGCTGCCGATATGACCGCCACGCCGCGCTAT 6640
 S F S E A R R A R Q H P V R T L L P D M T A H A R Y

Figure 2E

→ *yiaQ*

cAGCGCAAATACGCCACTAccTGCATTGATTGAAGCACTACAGGGCTATCACGCCGTATTAAGGAGCACGCATTATG 6720
 Q R K Y R H Y L H L I E A L Q G Y H A R I K E H A L *
 M

AGCCGACCATTACTGCAGCTGGCGcTCGACCATAACCAGCCTTCAGGCTGCGCAGCGCATGTCGCCCTGCTACAGGATCA 6800
 S R P L L Q L A L D H T S L Q A A Q R D V A L L Q D H

CGTTGATATTGTGGAGGCGGGAAACCATCCTCTGCTTAACCGAAGGGCTTAGCCGGTAAAGCCCTGCCGCCAGTGTGTC 6880
 V D I V E A G T I L C L T E G L S A V K A L R A Q C P

CGGGGAAGATCATCGCGCAGTGGAAAGTCGCCAGCAGCGGTGAAACCTGGCGCAGCAGGCCCTTGGCGCTGGCGCC 6960
 G K I I V A D W K V A D A G E T L A Q O A F G A G A

AACTGGATGACCATCATTGCGCCGACCGCTCGCCACGGTCGAGAAAGGCCACGCCGTGCCAGGCCCTGCCGTGCGCC 7040
 N W M T I I C A A P L A T V E K G H A V A Q A C G G E

AATTCAAGATGGAGCTGTTGGCAACTGGACGCTGGATGACGCCCGCCTGGTACCGTACCGCGTCCATCAGGCATTT 7120
 I Q M E L F G N W T L D D A R A W Y R T G V H Q A I Y

ACCATCGCGACCGGATGCCAGGCCAGCGGAGCGAGTGGGGGAGGCGGATCTGGCGCGCATGAAAGCGCTGTCCGAT 7200
 H R G R D A Q A S G Q Q W G E A D L A R M K A L S D

ATTGGCCCTTGAGCTATCGATTACCGCGGCATTACCCAGCCGATCTACCGCTGTTCAAAGATATCAACGTCAAAGCCTT 7280
 I G L E L S I T G G I T P A D L P L F K D I N V K A F

TATTGCCGGCGCGCCTGGCAGGCGCCGCATCCGGCGGGTTGCCGCCATTCCACGCGCAAATCGACGCTATCT 7360
 I A G R A L A G A A H P A R V A A E F H A Q I D A I W

→ *yiaR*

GGGGAGAACAGCATGCGTAACCACCCGTTAGGTATTTATGAAAAGCGCTGGCGAAGGATCTCAGCTGCCCTGAGCGCT 7440
 G E Q H A *
 M R N H P L G I Y E K A L A K D L S W P E R L

GGTACTGCCAAAAGCTGCCGTTTGATTTCGAAATGTCGGTGGACGAGACCGATGAACGCCCTTCGCCCTGGAGT 7520
 V L A K S C G F D F V E M S V D E T D E R L S R L E W

GGACCCCGGCCAGCGCGCATCGCTGGTGAGCGCGATGCTGGAAACCGCGTCGCCATTCCCTCGATGTGCTGTCCGCC 7600
 T P A Q R A S L V S A M L E T A V A I P S M C L S A

CATGCCGTTCCCTTGGCAGCCCGATGAAGCGTACCGATGGCGCAGAGAGATTATGACCAAAGCCATcCGCCT 7680
 H R R F P F G S R D E A V R D R A R E I M T K A I R L

GGCGCGCATCTGGGATCCGCCACCATCCAGCTGGGGTTACGACGTCTATTACGAAGAGCATGATGAAGGCACCCGGC 7760
 A R D L G I R T I Q L A G Y D V Y Y E E H D E G T R Q

AGCGTTTGCGAAGGGCTGCCGCTGGCGGTAGAACAGGCCGCCCGCAGGTAATGCTGGCGGTGGAGATCATGGAC 7840
 R F A E G L A W A V E Q A A A A Q V M L A V E I M D

ACCGCCTTATGAACTCCATCAGCAAATGGAAAAGTGGACGAGATGCTTCGTCACCGTGGTTACCGCTACCCGGA 7920
 T A F M N S I S K W K K W D E M L S S P W F T V Y P D

CGTCGGCAACCTCAGCGCCTGGGAAACGACGTACCGCCGAGCTGAAGCTGGCATCGATCGTATGCCGCCATCCACC 8000
 V G N L S A W G N D V T A E L K L G I D R I A A I H L

TGAAAGATACTGCTGCCGTGACCGACGATAGCCCTGCCAGTTCCCGACGTGCCGTTCGGAGATGCTGGACGGAGAAAGCCAGCGA 8080
 K D T L P V T D D S P G Q F R D V P F G E G C V D F

GTCGGCATTAAAGACGcTGGCGAGCTGAACCTACCGCGGTTCAATTGATTGAGATGCTGGACGGAGAAAGCCAGCGA 8160
 V G I F K T L R E L N Y R G S F L I E M W T E K A S E

→ *yiaS*

Figure 2F

GGCGGTGCTGGAGATTATCCAGGCCGGCGCTGGATCGAACATCACGGATGCAGGAAGGGGGATTACATGTTAGAACAACT P V L E I I Q A R R W I E S R M Q E G G F T C * M L E Q L	8240
GAAAGCCGAGGTACTGGCGCAAACCTGGCCCTCCCCGACACGGCTGGTCACCTTACCTGGGGCACGTCAGCGCG K A E V L A A N L A L P A H G L V T F T W G N V S A V	8320
TCGATGAAACCGCGCAAGCTGATGGTCATTAAGCCTCCGGCGTCGAATATGAGGTGATGACCGCCGACGATATGGTGGTC D E T R K L M V I K P S G V E Y E V M T A D D M V V	8400
GTAGAGATGGCCAGCGGTAAAGTCGTTGAAGCGGTAAAAAACCTCTTCAGATACGCCAACGCATCTGGCGTTATCG V E M A S G K V V E G G K K P S S D T P T H L A L Y R	8480
CCGCTATCCGCAGATCGCGGGATCGTCATACCCACTCCGCCACCGCACGATCTGGTCGCAGGCCGGCTCGATCTCC R Y P Q I G G I V H T H S R H A T I W S Q A G L D L P	8560
CcGCCTGGGCACCAACCCACGCCGACTACTTCTATGGCGCATTCCCGACGGATGACCGTTGAGGAGATTAAC A W G T T H A D Y F Y G A I P C T R R M T V E E I N	8640
GGCGAGTATGAGTATCAGACCGCGAGGTGATTATCAAACCTTGTAAACAGCGCCGCTGGATCCGGCGAAATCCGGC G E Y E Y Q T G E V I I K T F E Q R G L D P A Q I P A	8720
GGTATTGGTCCATTACACGGCCCCTTGCTGGGTAAAGACGCCGCCACGCCGTACATAACGCCGTTGCTGGAGG V L V H S H G P F A W G K D A A D A V H N A V V L E E	8800
AGTGCGCCTACATGGGCCTCTCGCGCCAGTGGCCACAGCTGCCGGATATGCAGTCTGAACGCTCGATAAACACTAT C A Y M G L F S R Q W P Q L P D M Q S E L L D K H Y L	8880
CTGCGTAAACACGGCGCGAACGCTATTACGGCAAAACTAGTCCCGCGAACCTCCCGGATAAGGCCTTGGCCCCGG R K H G A N A I T G K T S P A E L P G	8960
GGGAAGCGTGCAGGATGTTGCTGAACCTTCCGGAGCGATGCTGCCATCTGCCGGCTACCGTCCCCGGCGCTCTGC GGTCAGCACCGCGCCGGAAAACCCATCAACCTACGCCGAATTAAATATGTCCTGCACTAACGACGCTTCCACGCC	9040
GCCGGTCCAGGCTGGTGTGCTTGCAGGAAAATCTTGCAGGAAAATAGCCGACATCGTAAACCCGATTCATGCCACCTCG GTAATCGACAGGGAAATCGCTGATAAGCAGCTTCCGCCCTAACCGCTGACGGTGCAGCGCTCGGTAAACGTCAGC	9120
CGGAAAGCATGGCGATAAACGGCCCCAGATAACCCCGCTTGCAGTCAGCTCCT	9200
	9280

Figure 3

YiaJ-Ko	MGT -----KE	SEN TQD KERP	AGS QSL FRGL	M LIE ILS NYP	NGCPVAH LSE
YiaJ-Ec	MGKEVMGKKE	NEMAQEKERP	AGS QSL FRGL	M LIE ILS NYP	NGCP LAH LSE
YiaJ-Hi	MN IEVK -----	---MEKEKS	LGN QAL IRGL	R LLD ILS NYP	NGCP LAK LAE
YiaJ-Ko	LAG LNK STV H	R LLOG LQSCG	YVTPAPAAGS	Y ALTTKF IRV	GOKALSSLN I
YiaJ-Ec	LAG LNK STV H	R LLOG LQSCG	YVTTAPAAGS	YR LTTKF IAV	GOKALSSLN I
YiaJ-Hi	LAN LNK STAH	R LLOG LQNEG	YVKPANAAGS	YR LTIKCLS I	GOKVLSSMNI
YiaJ-Ko	IHVAAPHL EA	LN LA TGE TVN	FSS REDDHAT	L IYKLEPTTG	MIRTRAYIGO
YiaJ-Ec	IHIAAPHL EA	LN IA TGE T IN	FSS REDDHAT	L IYKLEPTTG	MIRTRAYIGO
YiaJ-Hi	IHVASPY LEQ	LN LK LGET IN	FSK REDDHAT	M IYKLEPTNG	MLKTRAYIGO
YiaJ-Ko	HMR --CTARQ	WAKIYMAFGH	P -DYVESYWN	SHQE IIQPLT	RNTITGLPAM
YiaJ-Ec	HMP LYCSAM -	-GKIYMAFGH	P -DYVKSYWE	SHQEHEIQPLT	RNTITELPAM
YiaJ-Hi	Y LK LYCSAM -	-GKI FLAYEK	KVDYLSHYWQ	SHQRE IKKLT	RYTITE LDD I
YiaJ-Ko	HDELAQIRER	NMAMDREENE	LGVSC LAVPV	FDIHGRVPYA	ISISLSTSRL
YiaJ-Ec	FDELAH IRES	GAAMDREENE	LGVSC IAVPV	FDIHGRVPYA	VSISLSTSRL
YiaJ-Hi	KLELETIRQT	AYAMDREENE	LGVTC IACP I	FDS FGQVEYA	ISVSMSIYRL
YiaJ-Ko	KQVGEKNLLK	PLRD TAE A IS	RELGF SVREG	-----	
YiaJ-Ec	KQVGEKNLLK	PLRE TAQA IS	NELGFTVRDD	LGA IT	
YiaJ-Hi	NKFGTDAFLQ	E IRK TAEQ IS	LELGYEN ---	---- I	

Figure 4

yiaK-Ko	MKVTFEQLKE	AENRVLLDAC	VARETADACA	EMFARTTESG	VYSHGVNRFP
yiaK-Ec	MKVTFEQLEKA	AENRVLISRG	VDSETADACA	EMFARTTESG	VYSHGVNRFP
yiaK-Hi	MRVSYDE LKN	E FKRVLLDRQ	LTEELAEECA	TAFTDTTQAG	AYSHGINRFP
yiaK-Ko	RFIQQLDNGD	IIPEAQPORV	TTLGAIEQWD	AQRSIGNLTA	KKMDRAIEL
yiaK-Ec	RFIQQLENGD	IIPDAQPKR I	TS LGAIEQWD	AQRSIGNLTA	KKMDRAIEL
yiaK-Hi	RFIQQLEQGD	IVPNAIPTKV	LS LGSIEQWD	AHQAGNLTA	KKMDRAIEL
yiaK-Ko	ASDHGIGLVA	LRNAHWMRG	GSYGWQAAEK	GYIGICWTNS	IAVMAPWGAK
yiaK-Ec	AADHGIGLVA	LRNAHWMRG	GSYGWQAAEK	GYIGICWTNS	IAVMPFWGAK
yiaK-Hi	ASQHGVGV IA	LRNAHWMRG	GSYGWQAAEK	GYIGICWTNA	LAVMPPWGAK
yiaK-Ko	ECRIGTNPLI	VAIPS TP ITM	VDMMSMSMFSY	GMLEVNRILAG	REL PVDGGFD
yiaK-Ec	ECRIGTNPLI	VAIPS TP ITM	VDMMSMSMFSY	GMLEVNRILAG	RQLPVDGGFD
yiaK-Hi	ECRIGTNPLI	IAVPTTP ITM	VDMSCSMYSY	GMLEVHRLAG	RQTFVDAGFD
yiaK-Ko	DDGRLTKEPG	TIEKNRILP	MGYWKGSGLS	IVLDMIATLL	SNGSSVAEV T
yiaK-Ec	DEGNLTKEPG	VIEKNRILP	MGYWKGSGLS	IVLDMIATLL	SDGASVAEV T
yiaK-Hi	DEGNLTDRPS	IVEKNRLLP	MGFWKGSGLS	IVLDMIATLL	SNGESTVAVT
yiaK-Ko	QENSDEYGV S	QIFIAIEVDK	LIDGATRDAK	LQRIMDFITT	AERADENVAV
yiaK-Ec	QDNSDEYG IS	QIFIAIEVDK	LIDGPTRDAK	LQRIMDYVTS	AERADENQAI
yiaK-Hi	EDKNDEYCVS	QVFIAIEVDR	LIDGKSKEK	LNRIMDYVKT	AERSDPTQAV
yiaK-Ko	RLPGHEFTRL	LDENRRNG IT	VDDSVWAK IQ	AL	
yiaK-Ec	RLPGHEFTTL	LAENRRNG IT	VDDSVWAK IQ	AL	
yiaK-Hi	RLPGHEFTTI	LSDNQ TNG IP	VDERVWALK	TL	

0 2 5 7 2 7 2 6 1 2 4 2 5 0 0

Figure 5

yiaL-K0	M I F G H I A Q P N	-P C R L P A A I E	R A L D F L R T T D	F H A L A P G V V E	I D G Q N I F A Q V
yiaL-Ec	M I F G H I A Q P N	-P C R L P A A I E	K A L D F L R A T D	F N A L E P G V V E	I D G K N I Y T Q I
yhcH-Hi	M I I S S L T N P N	F K V G L P K V I A	E V C D Y L N T L D	L N A L E N G R H D	I N D Q - I Y M N V

yiaL-Ko ID LTTRDAAE NRPEVHRRYL D-IQFLASGEE K-IG IA ID TGN NQ ISES LLEQ
yiaL-Ec ID LTTREAVV NRPEVHRRYI D-IQFLAWGEE K-IG IA ID TGN NKVSES LLEQ
yhcH-Hi MEPE TAEPPS KKAELHHEYL DVQVL IRGTE N IEVGA TYPN LSKYEDYNEA

yiaL-K0 RD IIFYHDSE HESFFEMTPG NYAIFFPQDV HRPGCNKTV A TP -IRKIVVK
yiaL-Ec RN IIFYHDSE HESF IEMIPG SYAIFFPQDV HRPGCIMQTA SE -IRKIVVK
yhcH-Hi DDYQLCADID DKFTV TMKPK MFAV FYPYEP HKPCCVVNGK TEKIKKLVVK

yiaL-Ko VA ISVL-
yiaL-Ec VALTAIN
yhcH-Hi VPVR -LI

Figure 6

IyxK-Ko	MSKKQAFWLG	IDCGGTYLKA	GLYDAEGHEH	GIVRQALR TM	SP LP GYAERD
IyxK-Ec	M TQ ---YWLG	LDCGGSWLKA	GLYDREGREA	GVQR LP LCAL	SP QPGWAERD
IyxK-Hi	MH ----YYLG	IDCGGTFIKA	A IFDQNGTLQ	S IA RRN IP II	SEKPGYAERD
IyxK-Ko	MRQI WQHCAA	TIAGLLQQAG	VSGEQIKGVG	ISAQGQGLFL	LDKQDRP LGN
IyxK-Ec	MAE I WQCCMA	VIRALLTHSG	VSGEQIVGIG	ISAQGKGLFL	LDKNDKPLGN
IyxK-Hi	MDE LWN LCAQ	VIQKTIQSS	ILPQQIKAIG	ISAQGKGAFF	LDKDNKE LGR
IyxK-Ko	AILSSDRRAL	KIVQRWQDRR	IPERLYPVTR	OTLWTGHPAS	LLRWVKENEP
IyxK-Ec	AILSSDRRAM	EIVRRWQEDG	IPEKLYPLTR	OTLWTGHPVS	LLRWLKEHEP
IyxK-Hi	AILSSDQRAY	EIVQCWQKEN	ILQKFYPI TL	OTLWMGHPVS	ILRWIKENEP
IyxK-Ko	ORYAQIGCVM	MGDYLRWCL	TGAKGCEESN	ISESNLYNMA	MGOYDPRITE
IyxK-Ec	ERYAQIGCVM	MTHDYLRWCL	TGVKGCEESN	ISESNLYNMS	LGEYDPC LTD
IyxK-Hi	SRYEQIHTIL	MSHDYLRFCL	TEKLYCEETN	ISESNFYNMR	EGKYD IQ LAK
IyxK-Ko	WLGI GE IDSA	LPPVVVGSAE I	CGE ITAQAAA	LTGLAAGTPV	VGGLFDVVST
IyxK-Ec	WLGI AE INHA	LPPVVVGSAE I	CGE ITAQ TAA	LTGLKAGTPV	VGGLFDVVST
IyxK-Hi	LFG ITEC IDK	LPPIIKSNI I	AGYVTSRAAE	QSGLVEGIPV	VGGLFDVVST
IyxK-Ko	ALCAG IEDES	TLNAVMG TWA	VTSGIAHGLR	DHEAHPYVYG	RYVNDGQY IV
IyxK-Ec	ALCAG IEDEF	TLNAVMG TWA	VTSGITRG LR	DGEAHPYVYG	RYVNDGEF IV
IyxK-Hi	ALCAD LKDDQ	HLNVVLG TWS	VVSGVTHYID	DNQTIPFVYG	KYPEKNKF II
IyxK-Ko	HEASPTSSGN	LEWF TAQWGD	LSFDE INQAV	ASLPKAGSEL	FFLPFLYGSN
IyxK-Ec	HEASPTSSGN	LEWF TAQWGE	ISFDE INQAV	ASLPKAGGDL	FFLPFLYGSN
IyxK-Hi	HEASPTSAGN	LEWFVNQFNL	PNYDD INHE I	AKLKPASSV	LFAPFLYGSN
IyxK-Ko	AGLEMTCGFY	GMOALHTRAH	LLOAVYEGVV	FSHMTHLSRM	RERFTNVQAL
IyxK-Ec	AGLEM TS GFY	GMQA IHTRAH	LLQA IYEGVV	FSHMTHLNRM	RERFTDVH TL
IyxK-Hi	AKLGMQAGFY	GIQSHHTQIH	LLQA IYEGV I	FSLMSH LERM	QVRFPNAS TV
IyxK-Ko	RVTGGPAHSD	VWMQM LADVS	GLRI ELPKVE	ETGCFGAA LA	ARVG TG VYRS
IyxK-Ec	RVTGGPAHSD	VWMQM LADVS	GLRI ELPQVS	ETGCFGAA LA	ARVG TG VYHN
IyxK-Hi	RVTGGPAKSE	VWMQM LAD IS	GMRLE IPNIE	ETGCLGA ALM	AMQAESA ---
IyxK-Ko	FSEARRARQH	PVRTL L PDMT	AHARYQRK YR	HYLHL TIA LQ	GYHAR IKE HA
IyxK-Ec	FSEAQRD L RH	PVRTL L PDMT	AHQLYOKK YQ	RYQHL TIA LQ	GFHAR IKE HT
IyxK-Hi	-VEISQ ILN I	DRK IFLPDKN	QYSKYQH KYH	RYLKF IEALK	NLD -----
IyxK-Ko	L				
IyxK-Ec	L				
IyxK-Hi	-				

Figure 7

yiaQ-Ko	MSRPLLQLAL	DHTSLQAAQR	DVALQDHVD	IVEAGTILCL	TEGLSAVKAL
yiaQ-Ec	MSRPLLQLAL	DHSSLEAAQR	DVTLLKDSVD	IVEAGTILCL	NEGLGAVKAL
yiaQ-Hi	MGKPLIEQIAL	DAQYLETALV	DVKQIEHNID	IEVGTILAC	SEGMRRAVRIL
yiaQ-Ko	RAQCPGKIV	ADWKVADAGE	TLAQQAEGAG	ANWMTIIICAA	PLATVEKGHA
yiaQ-Ec	REQCPDKIV	ADWKVADAGE	TLAQQAEGAG	ANWMTIIICAA	PLATVEKGHA
yiaQ-Hi	RALYPNQILV	CDLKTTDAGA	TLAKMAFEAG	ADWLTVSAAA	HPATKAACQK
yiaQ-Ko	VAQA -----	---CGGEIQM	ELFGNWTLD	ARAWYRTGVH	QAIYHRGRDA
yiaQ-Ec	MAQR -----	---CGGEIQI	ELFGNWTLD	ARDWHRIGVR	QAIYHRGRDA
yiaQ-Hi	VAEEFNKIQP	NLGVPKEIQI	ELYGNWNFDE	VKNWLQLGIK	QAIYHRSRDA
yiaQ-Ko	QASGQQWGEA	DLARMKALSD	IGLELSITGG	ITPADLP LFK	DIN -VKAFIA
yiaQ-Ec	QASGQQWGEA	DLARMKALSD	IGLELSITGG	ITPADLP LFK	DIR -VKAFIA
yiaQ-Hi	ELSGLWSNQ	DIENIEKLDS	LGIELSITGG	ITPDDLH LFK	NTKNLKAFA
yiaQ-Ko	GRALAGAAHP	ARVAAEFHAQ	IDA IWGEQHA		
yiaQ-Ec	GRALAGAANP	AQVAGDFHAQ	IDA IWGGARA		
yiaQ-Hi	GRALVGKSGR	-EIAEQLKQK	IGQFW-----I		

Figure 8

yiaR-Ko	MR -----	---NHP LG IV	EKA LAKD LSW	PER LV LAKSC	GFD FV EMSVD
yiaR-Ec	MRKSTL SGEV	RVRNHQ LG IV	EKA LAKD LSW	PER LV LAKSC	GFD FV EMSVD
yiaR-Hi	MKK -----	---HK IG IV	EKA LPKN ITW	QER LS LAKAC	GFE FIE MSID
yiaR-Ko	ETDER LSR LE	WTPAQ RAS LV	SAM LE TAVA I	PSMC LSAH RR	FPFGSRDEAV
yiaR-Ec	ETDER LSR LD	WSAAQ RTS LV	AAM IE TG VG I	PSMC LSAH RR	FPFGSRDEAV
yiaR-Hi	ESNDRL SRLN	WTKSER IALH	QS II QSG IT I	PSMC LSAH RR	FPFGSKDKK I
yiaR-Ko	RDRARE IMTK	AIR LARD LG I	RT IQ LAGY DV	YYEEH DEG TR	QR FAEGLAWA
yiaR-Ec	RERARE IMSK	AIR LARD LG I	RT IQ LAGY DV	YYEDH DEG TR	QR FAEGLAWA
yiaR-Hi	RQKSFE IMEK	AID LS VNL GT	RT IQ LAGY DV	YYEKQDEE TI	KY FQEG IE FA
yiaR-Ko	VEQAAA AQVM	LAVE IMD TAF	MNS IS KW KKW	DEM LSS PWFT	VYPDVG NLSA
yiaR-Ec	VEQAAA ASQVM	LAVE IMD TAF	MNS IS KW KKW	DEM LAS PWFT	VYPDVG NLSA
yiaR-Hi	VTLAASA QVT	LAVE IMD TPF	MSS IS RW KKW	DT II NS PWFT	VYPDIGN LSA
yiaR-Ko	WGNDV TAE LK	LG IDR IAA IH	LKD TLPV TDD	SPGQFR DVPF	GEGCVDFV G I
yiaR-Ec	WGNDV PAELK	LG IDR IAA IH	LKD TQPV TGQ	SPGQFR DVPF	GEGCVDFV G I
yiaR-Hi	WNNN IEE ELT	LG IDK ISA IH	LKD TYPV TET	SKGQFR DVPF	GOGCVDFVHF
yiaR-Ko	FKT LRE LNYR	GSFL IEMW TE	KASEP VLE II	QARRW IESRM	QE GGFTC
yiaR-Ec	FKT LHK LNYR	GSFL IEMW TE	KAKEP VLE II	QARRW LEARM	QEAGF IC
yiaR-Hi	FS LLKK LNYR	GAFL IEMW TE	KNEEP LLE II	QARKW IVQQM	EKAGLLC

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Figure 9

yiaS-Ko	MLEQLRAEVL	AANLALPAHG	LV TFTWGNVS	AVDE TRKLMV	IKPSGVVEYEV
yiaS-Ec	MLEQLKADVL	AANLALPAHH	LV TFTWGNVS	AVDE TRQWMV	IKPSGVVEYDV
yiaS-Hi	MLAQIKKEVVF	EANLALPKHH	LV TFTWGNVS	AIDREKNLVV	IKPSGVDYDV
yiaS-Ko	MTADDMVVVE	MASGVVVEGG	KKPSSDTPTH	LA LYRYPQT	GG IVHTHSRH
yiaS-Ec	MTADDMVVVE	IASGVVVEGS	KKPSSDTPTH	LA LYRYYAEI	GG IVHTHSRH
yiaS-Hi	MTENDMVVVD	LFTGN IVEGN	KKPSSDTPTH	LE LYRQFPHI	GG IVHTHSRH
yiaS-Ko	ATIWSQAGLD	LPAWGTTBAD	YFYGAIPCTR	RMTVEEINGE	YEYQTGEVII
yiaS-Ec	ATIWSQAGLD	LPAWGTTBAD	YFYGAIPCTR	QMTAEEINGE	YEYQTGEVII
yiaS-Hi	ATIWAQAGLD	IIEVGTTHGD	YFYGTIPCTR	QMTTKEIKGN	YELE TGKVIV
yiaS-Ko	KTFEQRGLDP	AQIPAVLVHS	HGPFAWGKDA	ADAVHNAVVL	EECAYMGLFS
yiaS-Ec	ETFEERGRSP	AQIPAVLVHS	HGPFAWGKNA	ADAVHNAVVL	EECAYMGLFS
yiaS-Hi	ETFLSRGIEP	DNIPAVLVHS	HGPFAWGKDA	NNAVHNAVVL	EEVAYMNLFS
yiaS-Ko	RQW-PQLPDM	QSELLDKHYL	RKHGANAITG	KTSPAELPG	
yiaS-Ec	RQLAPQLPAM	QNELLDKHYL	RKHGANAYYG	Q-----	
yiaS-Hi	QQLNPyLSPM	QKDLLDKHYL	RKHGQNAYYG	Q-----	

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Figure 10

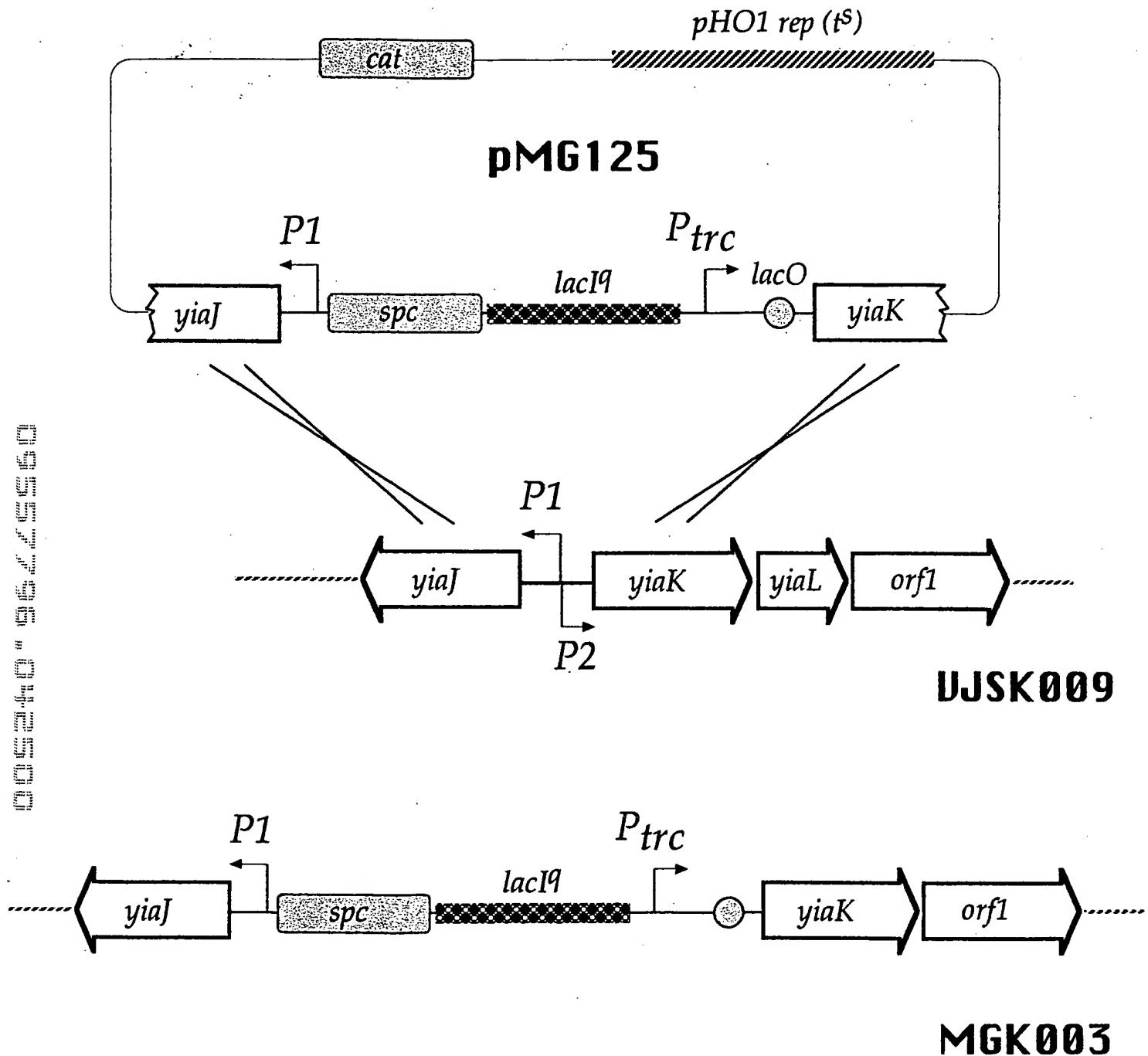
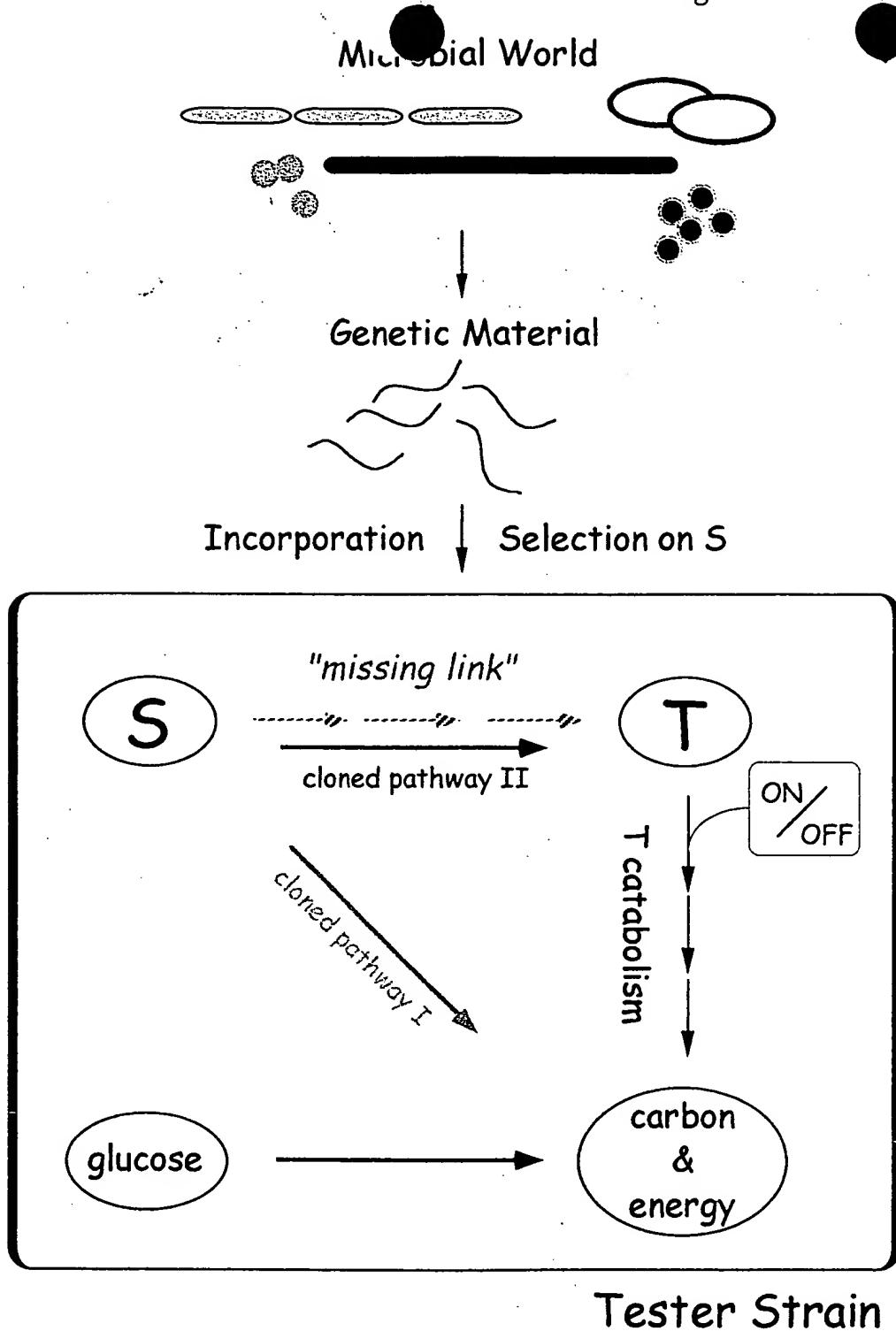
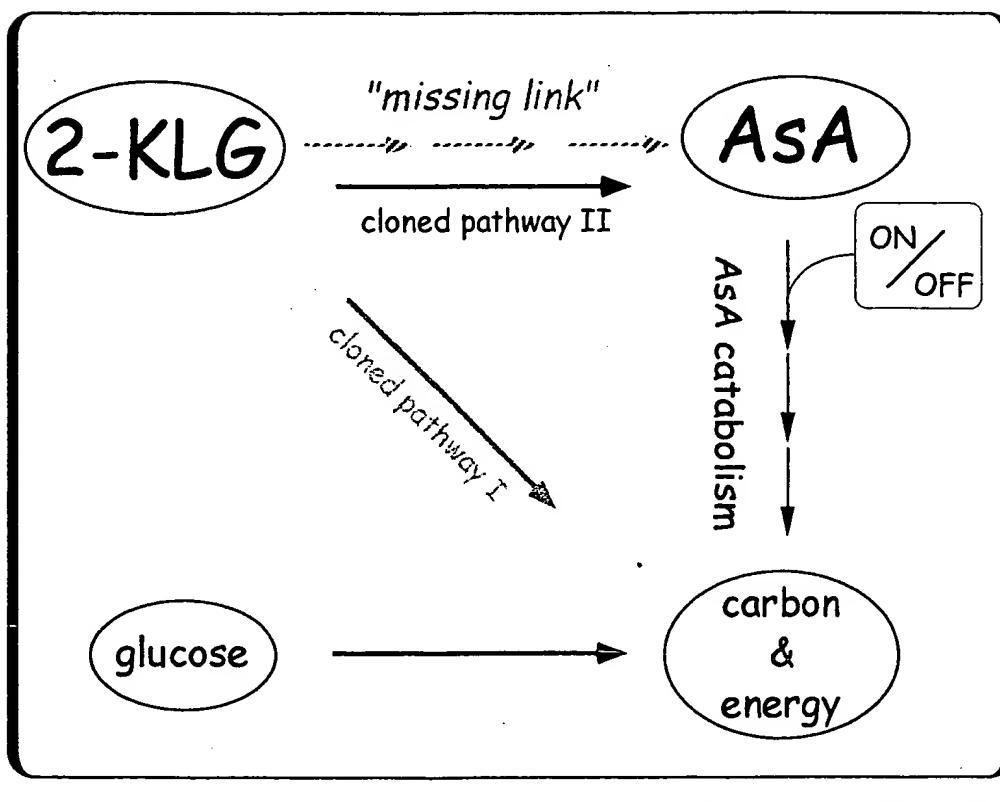
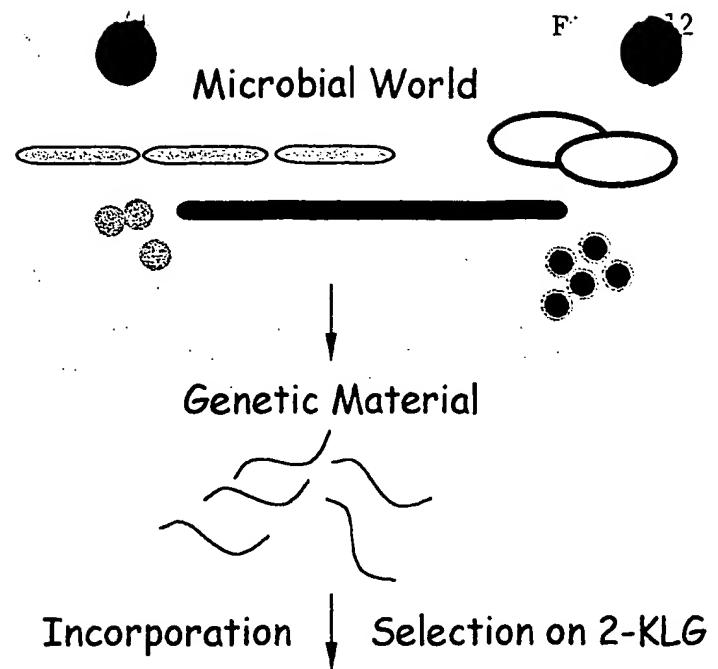


Figure 11

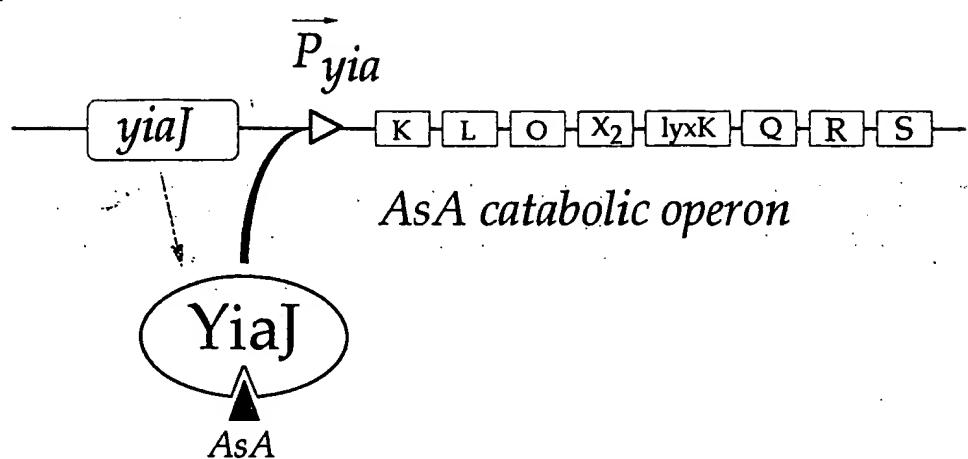




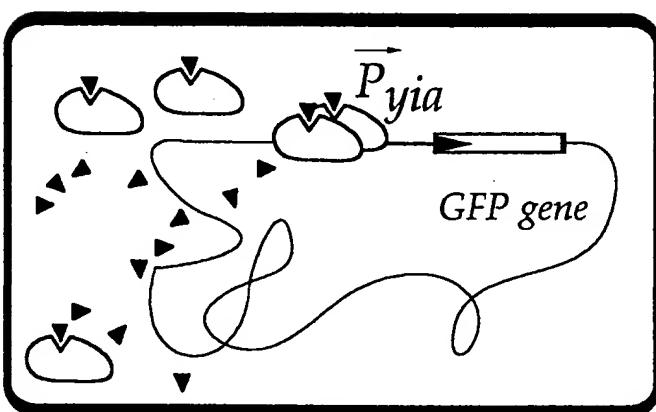
The Metabolic Selection Strategy

Figure 13

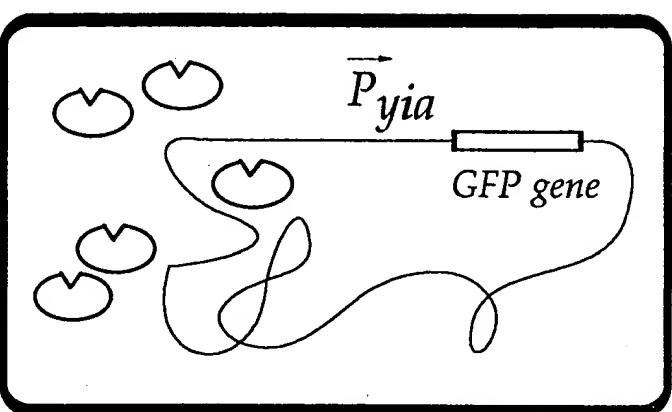
A



B



GFP +



GFP -

